Trend Study 22-4-03

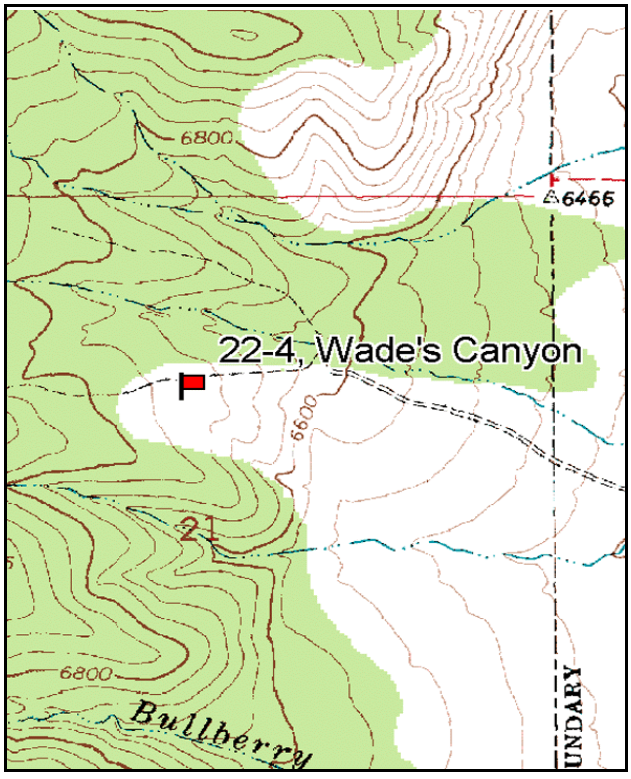
Study site name: Wades Canyon . Vegetation type: Big Sagebrush-Grass .

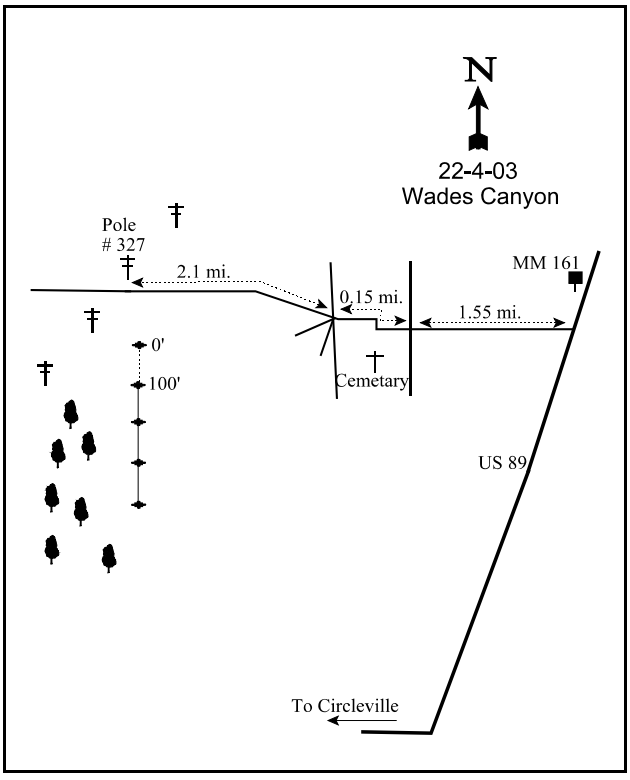
Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From mile marker 161 on US 89, north of Circleville, drive south 0.5 mile to a dirt road. Turn west and go 1.55 miles through the north end of Circleville to a jog in the road. Continue west past the jog 0.15 miles to the Circleville cemetery. Drive around the cemetery to the northeast corner. From the corner, a faint road takes off at a 45-degree angle to the northwest. Proceed up this road 2.1 miles to the point where it crosses under a high tension powerline. Stop here. The pole (# 327) nearest the road has a red browse tag #7046 attached under a yellow reflector. Walk 300 feet due south to the first frequency baseline stake. The 0-foot stake is a 2-1/2 foot tall rebar tagged #7045. There is an unmarked pellet group transect here also.





Map Name: Circleville

Diagrammatic Sketch

Township 30S , Range 4W , Section 21

GPS: NAD 27, UTM 12S 4227350 N, 384704 E

DISCUSSION

Wades Canyon - Trend Study No. 22-4

This study is located northwest of Circleville just inside the Forest Service boundary at an elevation of 6,700 feet. The site drains to the east on a 7-10% slope. The vegetation type is sagebrush-grass, but pinyon-juniper are encroaching onto the site. The DWR Wades Canyon pellet group transect located nearby showed that deer use increased from 3 deer days use/acre (8 ddu/ha) in 1976-77 to 17 (42 ddu/ha) in 1980-81, with a 5 year average of 12 days use/acre (30 ddu/ha). Deer use had increased to 31 days use/acre (77 ddu/ha) by 1984-85, with a 5 year average between 1981 and 1985 of 24 deer days use/acre (59 ddu/ha) (Jense et al. 1985). Between 1986 and 1990, the trend continued to increase with an average of 27 deer days use/acre (67 ddu/ha). It appears that 1990 was the last time the permanent pellet group transect was read. A pellet group transect read on the trend study site in 1998 estimated 42 deer days use/acre (104 ddu/ha) and <1 cow days use/acre (2 cdu/ha). Pellet group transect data in 2003 indicated a large increase of deer on the site at an estimated 154 deer day use/acre (380 ddu/ha). A few elk pellet groups were also sampled in the transect.

Soils are a loam in texture and have a neutral pH (7.1). Soil depth is moderate with an effective rooting depth of 11 inches. Soil temperature averaged 62°F at a depth of 12 inches in 1998. A dense hardpan is found at a depth of about 10-12 inches. Phosphorous is relatively low at 8.8 ppm when at least 10 ppm is considered necessary for normal plant growth. The soil's water holding capacity is poor. Some soil movement is detectable, but the negligible slope reduces the potential for serious erosion problems. An erosion condition class assessment rated soils as stable to slightly eroding in 2003. Rock and pavement are abundant on the soil surface and bare soil was relatively low at 11% in 2003. Soil pedestalling around shrub and bunchgrass stems is high.

Wyoming big sagebrush is the principal key species. Wyoming big sagebrush provides about 1/2 of the browse cover on the site and had an estimated density of 2,920 plants/acre in 1998 and 2003. The population of Wyoming big sagebrush on this site is in poor condition. Seedling and young plants occurred in low densities in 1998 and 2003 and percent decadence has been high in all years ranging from 38% in 1985 to 61% in 1998. Decadence declined in 2003 to 47%, but this level is still too high. The proportion of the decadent age class classified as dying has also been high from 1991-2003 ranging from 45%-67%. Use on Wyoming big sagebrush has been moderate to heavy in most years. The proportion of the population displaying poor vigor peaked at 64% in 1998. Those plants with poor vigor was only moderately high in both 1991 and 2003 at 31% and 21%respectively. In 1985, it was reported that surrounding the Circleville dump, located between Circleville and the transect, there was an extensive area (1-2 square miles) where the sagebrush appeared very chlorotic and in poor health. Except for a healthy-looking row on either side of the road (in the burrow pit), these plants appeared to have lost most of their leaves and were just starting to grow new ones. This could have been due to a Roga moth infestation. Periods of drought corresponding to the 1991 and 2003 surveys have also had a definitive negative effect on the health of sagebrush. Annual leader growth on big sagebrush averaged 1.6 inches in 2003.

Narrowleaf low rabbitbrush and broom snakeweed were both abundant in 1998 and 2003. Rabbitbrush density was estimated at 4,840 plants/acre in 1998 and 5,860 in 2003. Broom snakeweed density increased by 72% in 2003 from 1,680 plants/acre to 6,020. These populations should be monitored closely in the future for further increases. Point-center quarter data estimated 67 pinyon trees/acre and 58 Utah juniper trees/acre in 2003.

The herbaceous understory at Wades Canyon has low diversity. Indian ricegrass and bottlebrush squirreltail are the only perennial grass species to be sampled on the transect. Bottlebrush squirreltail was more abundant in 1998 than Indian ricegrass, but significantly declined in nested frequency and cover in 2003. Indian ricegrass has maintained a stable nested frequency value over all years. In 2003, Indian ricegrass was noted as

having good stature and vigor. Needle-and-thread grass has a more clumped distribution, it was not sampled within the transect. Sum of nested frequency for perennial grasses increased the first three readings, but declined by 35% in 2003 with drought conditions. Composition and production of the forb component is poor on this site. No annual forbs were sampled until 2003 when an annual *Gilia* was the most abundant forb on the site. Tansy mustard and stickseed are other annual species sampled in 2003. Prickly phlox and low fleabane were the most abundant perennial forbs in 1998, but both species declined in 2003. Sum of nested frequency for perennial grasses and forbs declined by 51% between 1998 and 2003. This is not surprising as spring precipitation averaged less than 50% of normal at Circleville from 2001 to 2003 (Utah Climate Summaries 2004).

1985 APPARENT TREND ASSESSMENT

The soil appears stable due largely to the gentle slope. Trend in the vegetative community appears stable to slightly downward. The sagebrush is receiving increasingly heavy use from wintering deer. Reproduction and vigor may be declining. Pinyons appear to be encroaching into the sagebrush flats.

1991 TREND ASSESSMENT

Since 1985, percent bare ground cover has increased from 8% to 14%. Percent litter, rock, and vegetation cover have all decreased. This indicates a slight downward trend for soil. This could turn around with an end to the extended drought we are now in. The key browse species is Wyoming big sagebrush. Low rabbitbrush, an increaser, is also abundant. Both species experienced increases in their respective densities, but percent decadence for sagebrush is high at 47%. Sagebrush also shows increased heavy use and poor vigor since 1985. The trend for browse is slightly downward. The herbaceous understory has a slightly downward trend due to a decrease in mostly perennial forbs.

TREND ASSESSMENT
soil - slightly down (2)
browse - slightly down (2)
herbaceous understory - slightly down (2)

1998 TREND ASSESSMENT

The soil trend is slightly upward with an increase in percent litter cover and a decrease in percent bare ground. Erosion potential is low due to the relative levelness of the site. The browse trend is downward with the health of the Wyoming big sagebrush population continuing to deteriorate. There is an increase in percent decadence as well as the proportion of decadent plants classified as dying. Currently, there are three live plants for every one dead encountered. It appears that this will continue to increase in the future. The herbaceous understory trend is stable. Grass sum of nested frequency has increased while forb sum of nested frequency has decreased. Overall, herbaceous sum of nested frequency values are similar to 1991 estimates.

TREND ASSESSMENT
soil - slightly up (4)
browse - down (1)
herbaceous understory - stable (3)

2003 TREND ASSESSMENT

Trend for soil is stable. Ground cover characteristics remain similar to 1998 estimates. There is some erosion occurring on the site but it is not excessive. Trend for browse is stable. Wyoming big sagebrush shows some improvement in percent decadence as well as the proportion of the decadent age class classified as dying has decreased. Vigor has also improved considerably since 1998. Even with these improvements, decadence

remains relatively high at 47%. Composition of young plants only makes up about 5% of the population. This is not adequate to replace the decadent, dying plants within the population. The density estimate for Wyoming big sagebrush is identical to 1998. Two increasers, low rabbitbrush and broom snakeweed, increased in density in 2003. These increasers should be monitored closely for further expansion. The herbaceous understory has a downward trend as sum of nested frequency values for perennial species declined by a large margin in 2003. Bottlebrush squirreltail was the most abundant perennial grass in 1998, but significantly declined by 2003. Perennial forb nested frequency declined by nearly 75% in 2003 with the biggest loss coming to low fleabane. Annuals are also coming into the site as they were first sampled in 2003.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down (1)

HERBACEOUS TRENDS --
Management unit 22 , Study no: 4

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Bromus tectorum (a)	-	-	1	5	.00	.03
G	Oryzopsis hymenoides	138	133	150	144	5.26	4.76
G	Sitanion hystrix	$_{a}$63	$_{a}$84	$_{b}$184	$_{a}$74	7.67	.59
Total for Annual Grasses		0	0	1	5	0.00	0.03
Total for Perennial Grasses		201	217	334	218	12.94	5.36
Total for Grasses		201	217	335	223	12.94	5.39
F	Arabis spp.	-	4	-	-	-	-
F	Astragalus calycosus	$_{b}$46	$_{b}$62	$_{a}$12	$_{a}$2	.08	.00
F	Castilleja chromosa	$_{b}$15	$_{a}$-	$_{a}$-	$_{a}$-	-	-
F	Chaenactis douglasii	$_{c}$28	$_{ab}$9	$_{a}$3	$_{a}$-	.00	-
F	Delphinium occidentale	-	-	-	1	-	.00
F	Descurainia pinnata (a)	-	-	-	57	-	.28
F	Erigeron pumilus	$_{c}$150	$_{b}$95	$_{bc}$118	$_{a}$2	1.21	.01
F	Gilia spp. (a)	-	-	$_{a}$-	$_{b}$209	-	1.75
F	Lappula occidentalis (a)	-	-	$_{a}$-	$_{b}$13	-	.14
F	Mentzelia spp.	-	-	$_{a}$-	$_{b}$12	-	.07
F	Physaria chambersii	$_{b}$36	$_{b}$21	$_{b}$32	$_{a}$-	.10	-
F	Phlox hoodii	$_{ab}$72	$_{b}$99	$_{ab}$82	$_{a}$48	2.44	.53
F	Thlaspi montanum	$_{b}$19	$_{a}$-	$_{a}$-	$_{a}$-	-	-
F	Unknown forb-perennial	1	-	-	-	-	-
Total for Annual Forbs		0	0	0	279	0	2.18
Total for Perennial Forbs		367	290	247	65	3.84	0.63
Total for Forbs		367	290	247	344	3.84	2.81

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 22 , Study no: 4

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata wyomingensis	76	74	11.38	8.52
B	Chrysothamnus viscidiflorus stenophyllus	73	80	8.23	7.46
B	Gutierrezia sarothrae	36	49	.79	.68
B	Juniperus osteosperma	2	3	.78	2.00
B	Opuntia spp.	2	4	.03	.03
B	Pinus edulis	2	3	.63	-
Total for Browse		191	213	21.85	18.71

CANOPY COVER, LINE INTERCEPT --
Management unit 22 , Study no: 4

Species	Percent Cover	
	'98	'03
Artemisia tridentata wyomingensis	-	6.21
Chrysothamnus viscidiflorus stenophyllus	-	8.13
Gutierrezia sarothrae	-	.06
Juniperus osteosperma	-	2.16
Pinus edulis	1.20	1.20

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 22 , Study no: 4

Species	Average leader growth (in)
	'03
Artemisia tridentata wyomingensis	1.6

POINT-QUARTER TREE DATA --
Management unit 22 , Study no: 4

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	47	58
Pinus edulis	58	67

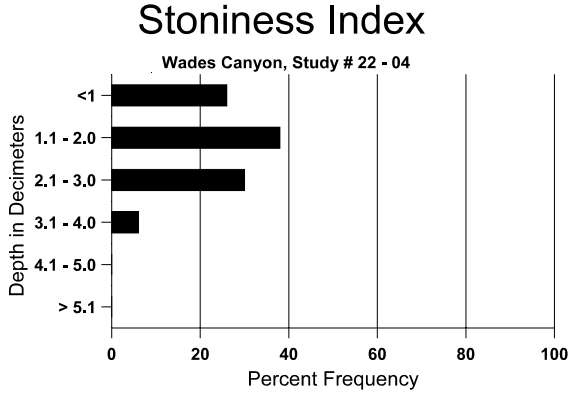
Average diameter (in)	
'98	'03
5.1	3.8
4.7	2.7

BASIC COVER --
Management unit 22 , Study no: 4

Cover Type	Average Cover %			
	'85	'91	'98	'03
Vegetation	6.25	5.25	34.92	27.25
Rock	21.25	17.75	17.62	16.10
Pavement	39.75	41.50	30.56	24.55
Litter	25.00	17.25	26.46	26.49
Cryptogams	.25	4.75	2.44	4.17
Bare Ground	7.50	13.50	6.94	11.24

SOIL ANALYSIS DATA --
Management unit 22, Study no: 4, Study Name: Wades Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
11.0	68.0 (12.5)	7.1	42.0	31.4	26.6	3.0	8.8	96.0	0.7



PELLET GROUP DATA --
Management unit 22 , Study no: 4

Type	Quadrat Frequency	
	'98	'03
Rabbit	18	10
Elk	-	2
Deer	24	31

Days use per acre (ha)	
'98	'03
-	-
-	3 (8)
42 (104)	154 (380)

BROWSE CHARACTERISTICS --
Management unit 22 , Study no: 4

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
85	**4599**	66	666	2200	1733	-	58	20	38	6	20/24
91	**5399**	-	733	2133	2533	-	27	62	47	31	17/22
98	**2920**	60	240	900	1780	1000	26	4	61	64	19/27
03	**2920**	-	140	1400	1380	920	55	11	47	21	19/24
Chrysothamnus viscidiflorus stenophyllus											
85	**7199**	-	1200	4933	1066	-	12	0	15	0	10/10
91	**8266**	-	400	6400	1466	-	23	61	18	5	8/9
98	**4840**	-	360	4240	240	40	1	0	5	2	12/16
03	**5860**	-	40	5700	120	180	0	0	2	.34	13/16
Gutierrezia sarothrae											
85	**200**	-	-	200	-	-	0	0	0	0	8/5
91	**333**	-	-	333	-	-	0	20	0	0	7/6
98	**1680**	-	340	1280	60	80	0	0	4	4	8/9
03	**6020**	-	4820	1080	120	40	0	0	2	.99	7/6
Juniperus osteosperma											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**40**	-	20	20	-	-	0	0	-	0	-/-
03	**60**	-	-	60	-	-	0	0	-	0	-/-
Opuntia spp.											
85	**266**	-	66	200	-	-	0	0	-	75	5/3
91	**133**	-	-	133	-	-	0	0	-	0	5/9
98	**40**	-	-	40	-	-	0	0	-	0	5/11
03	**80**	-	-	80	-	-	0	0	-	0	4/9
Pinus edulis											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**40**	-	-	40	-	-	0	0	-	0	-/-
03	**60**	-	40	20	-	-	0	0	-	0	-/-